

What is claimed is:

1 1. A method of forming copper interconnect, comprising:
2 forming a dielectric layer over a substrate, the dielectric layer having
3 trenches therein;
4 forming a copper diffusion barrier at least in the trenches;
5 depositing copper over the copper diffusion barrier and over a top surface
6 of the dielectric layer; and
7 polishing the copper with a high pH slurry;

1 2. The method of Claim 1, wherein the dielectric layer comprises an oxide of
2 silicon, and the copper diffusion barrier is electrically conductive.

1 3. The method of Claim 1, wherein the dielectric layer comprises a
2 fluorinated oxide of silicon, and the copper diffusion barrier is selected from the
3 group consisting of tantalum, and tantalum nitride.

1 4. The method of Claim 1, wherein the high pH slurry has a pH between
2 approximately 7.5 and 12.

1 5. The method of Claim 4, wherein the high pH slurry has a pH between
2 approximately 8 and 11.5.

1 6. The method of Claim 1, wherein the slurry contains approximately 2% to
2 10% by weight of SiO_2 .

1 7. The method of Claim 1, wherein the slurry contains an oxidizer comprising
2 $(\text{NH}_4)_2\text{S}_2\text{O}_8$.

1 8. The method of Claim 1, wherein polishing comprises chemical mechanical
2 polishing with a down force of less than or equal to approximately 3.75 psi.

1 9. The method of Claim 1, wherein polishing comprises:
2 engaging the copper with a polishing pad with a down force less than or
3 equal to 3.75 psi; and
4 providing a slurry flow rate of approximately 200 ccm.

1 10. The method of Claim 9, wherein polishing further comprises an orbital
2 speed of approximately 310 rpm and a wafer rotational speed of approximately
3 10 rpm.

1 11. A method of polishing a film, comprising:
2 polishing the film with a slurry having a pH in a range such that a
3 protective layer is formed over the film during polishing.

1 12. The method of Claim 11, wherein the film comprises copper and the pH is
2 the range of approximately 8 to 11.5.

1 13. The method of Claim 12, wherein the slurry comprises a precipitated SiO_2 .

1 14. The method of Claim 13, wherein the precipitated SiO_2 comprises
2 approximately 2 to 10 wt.% of the slurry.

1 15. A slurry, comprising:
2 an abrasive comprising precipitated SiO_2 ;
3 an oxidizer;
4 a corrosion inhibitor; and
5 a buffer system;
6 wherein the slurry has a pH between 8 and 11.5.

1 16. The slurry of Claim 15, wherein the abrasive is approximately 5 wt.%
2 precipitated SiO_2 .

1 17. The slurry of Claim 15, wherein the oxidizer comprises $(\text{NH}_4)_2\text{S}_2\text{O}_8$.

1 18. The slurry of Claim 17, further comprising reaction products of
2 $(\text{NH}_4)_2\text{S}_2\text{O}_8$.

- 1 19. The slurry of Claim 15, wherein the oxidizer comprises $K_2S_2O_8$.
- 1 20. The slurry of Claim 19, further comprising reaction products of $K_2S_2O_8$.
- 1 21. The slurry of Claim 15, wherein the oxidizer comprises $K_3Fe(CN)_6$.
- 1 22. The slurry of Claim 21, further comprising reaction products of $K_3Fe(CN)_6$.
- 1 23. The slurry of Claim 15, wherein the corrosion inhibitor comprises
2 benzotriazole.
- 1 24. The slurry of Claim 15, wherein the buffer comprises K_3PO_4 and K_2HPO_4 .
- 1 25. The slurry of Claim 18, further comprising a getter such as $Ba(OH)_2$.
- 1 26. The slurry of claim 20 further comprising a getter such as $Ba(OH)_2$.
- 1 27. A slurry comprising:
2 water;
3 approximately 5 wt. % precipitated SiO_2 ;
4 approximately 0.05 M $(NH_4)_2S_2O_8$;
5 approximately 0.005 M benzotriazole; and

- 6 a buffer comprising approximately 0.175 g/l K_3PO_4 and approximately
7 0.046 g/l K_2HPO_4 ;
8 wherein the slurry has a pH between approximately 8 and 11.5.

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